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ABSTRACT

Environmental education is generally thought to be an approach to teaching and learning that will help students develop the knowledge, skills, and values basic to environmental problem solving. This report addresses the need for environmental education and attempts to clarify definitions of some of the efforts such as outdoor education and conservation that have served as forerunners of environmental education. It includes a copy of the conference declaration of the world's first intergovernmental conference on environmental education which was held in Tbilisi, Russia, in 1977. Five basic objectives for environmental education are discussed, along with the need to infuse environmental education into the K-12 curriculum. Included is a set of seven short case studies of exemplary environmental education programs along with a list of resource materials on the subject. (TW)

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Environmental Education: Making the Future More Promising

In looking toward the future and developing appropriate curricula for our schools, we should recognize that an essential component must be educating young people about the state of our environment, the threats to the health of that environment, and, consequently, the threats to man's continued existence on earth.

Since the early 1970s, when the so-called "environmental movement" began, people have grown increasingly aware of and concerned about environmental quality in their towns, cities, states, and the nation as a whole and how it affects them individually. Today, however, as our knowledge grows and our vision enlarges, we have come to see the true extent of many environmental problems: they are worldwide, and they may threaten the existence of life on earth.

Environmental education is an approach to teaching and learning that will help students develop the knowledge, skills, and values basic to effective environmental problem solving. It is a process by which young people learn to take personal responsibility for their environments, develop broader perspectives, and become involved in finding solutions to current and future environmental issues.

The State of the World

In the past several decades, humankind has achieved a host of remarkable technological advances that have brought comfort and prosperity to many. At the same time, many of these advances have brought with them serious environmental consequences that threaten the quality of life for all of earth's inhabitants. Exponential population growth, a consuming lifestyle in developed nations, and widespread political and social inequalities have resulted in increasing stress on the world's natural resources and human well-being.

And the rate of technological advance is accelerating, often with unknown and unpredictable consequences. Looking ahead, we face an uncertain future, threatened by a degraded environment and a substan-

tial decrease in the quality of our lives. In many parts of the world, environmental destruction has already resulted in extreme poverty, social unrest, and political disruption. The litany of the sources of today's worldwide environmental ills is extensive; here are some of the major sources:

- *Tropical rain forests are being cleared* at unprecedented rates for agricultural use and human settlements, causing the disappearance of countless species of plants and animals dependent on that fragile environment. Clearing these forests may also create worldwide climactic changes.
- *Fossil fuel consumption* and the use of the automobile are causing a global warming trend that threatens to alter the patterns of agriculture from pole to pole and to raise sea levels because of the melting of the earth's ice caps.
- *Toxic chemicals*, through improper disposal and misuse, are threatening our drinking water supplies and the quality of the air we breathe.
- *The erosion of critical topsoil* as a result of poor agricultural practices is leading to food shortages and human starvation.
- *Deserts that result from erosion and human pressure* are expanding alarmingly, consuming once-productive lands at a rate of more than six million hectares per year and forcing many people to abandon their agricultural lifestyle.
- *Urban environments are being stretched* to their limits to provide sanitation, health care, and employ-

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ment as more and more people are forced to leave their rural settings and move to the city.

- *Human population continues to spiral upward* at a rate that has seen total world population rise from three billion to five billion since 1950, adding stress to the world's ecosystems.
- *Some of the economic policies of developed nations* are contributing to environmental destruction in less-developed countries, adding to the never-ending cycle of environmental degradation, social dislocation, and economic crisis.
- *The threat of self-destruction by nuclear weapons* hangs over our heads as so many of the world's nations add to their arsenals.

If current trends continue, says the *Global 2000 Report to the President, Entering the Twenty-First Century* (1980), the world faces a future that is

... more crowded, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today.

For hundreds of millions of the desperately poor, the outlook for food and other necessities of life will be no better. For many, it will be worse. Barring revolutionary advances in technology, life for most people on earth will be more precarious in 2000 than it is now—unless nations of the world act decisively to alter current trends.

Clearly, education must assume a major role in preparing citizens capable of participating in the resolution and prevention of such global issues and problems. Educators have a unique opportunity and a responsibility to provide their students with the knowledge, skills, and resolution to deal with the problems they will inherit.

What Is Environmental Education?

Environmental education has suffered from an identity crisis for a long time; many people consider the terms *conservation education*, *outdoor education*, and *environmental education* as interchangeable. But they are not, and the differences among them are clear.

Conservation education is a product of our country's agricultural roots and deals mainly with teaching and learning about natural resource issues such as forests, soil, water, and wildlife.

Outdoor education is a *method* of teaching skills and knowledge about the outdoor environment and its components through outdoor experiences.

Environmental education is an interdisciplinary, holistic process by which the learner:

- Develops an awareness of the natural and man-made environment
- Develops knowledge about how the environment works
- Acquires knowledge about the technological, social, cultural, political, and economic relationships occurring in environmental issues
- Develops active inquiry and problem-solving skills, along with appropriate values to guide behavior in dealing with environmental issues
- Becomes motivated to apply action strategies to maintain a balance between quality of life and quality of environment.

Ideally, environmental education should pervade all grade levels and all subject areas, beginning with pre-school and continuing through high school and beyond to become a life-long process for every citizen. It is critical to the development of a sense of responsibility on the part of all people toward their environment and a commitment to the future and to the health of future generations.

Five Basic Objectives

What will our secondary school curricula look like in the year 2000 and beyond? What programs will school administrators and their associates create to help students become "world-problem solvers"? David H. Larson, assistant superintendent of the Southington, Conn., public schools, had this to say in the April 1983 *NASSP Bulletin*:

The mission for educational leaders is to examine the school curriculum that is, and plan for the curriculum that will be. One word of caution, however. No matter how future-oriented, a curriculum can never completely anticipate all student needs. As one thinks about and plans for the future, one must remain flexible enough to accommodate the unexpected. Rather than a singular approach to planning, one must consider a variety of alternatives.

In *A Guide to Curriculum Planning in Environmental Education*, published by the Wisconsin Department of Public Instruction, author David C. Engleson suggests that programs in environmental education have five kinds of objectives: awareness, knowledge, attitudes, skills, and participation.

Awareness involves the development of a sensitivity to the environment and its associated problems. This is best developed at a young age by providing students with opportunities to experience the natural world and to develop an appreciation and understanding of its processes.

As a foundation for further involvement in environ-

Table 1
Tbilisi Conference Declaration of Desirable Characteristics of Environmental Education

The Tbilisi Conference

The World's First Intergovernmental Conference on Environmental Education was organized by the United Nations Education, Scientific, and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP) and convened in Tbilisi, Georgia, USSR in October of 1977. This conference, made up of representatives of 66 nations and various nongovernmental organizations, declared that environmental education was an essential means of addressing global environmental problems. Participants at the conference adopted a declaration addressing the need for environmental education, stating that EE should:

- ... Consider the environment in its totality—natural and built, technological and social (economic, political, cultural-historical, moral, aesthetic)
- ... Be a continuous lifelong process, beginning at the preschool level and continuing through all formal and nonformal stages
- ... Be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective
- ... Examine major environmental issues from local, national, regional, and international points of view so that students receive insights into environmental conditions in other geographical areas
- ... Focus on current and potential environmental sit-

uations while taking into account the historical perspective

- ... Promote the value and necessity of local, national, and international cooperation in the prevention and solution of environmental problems
- ... Explicitly consider environmental aspects in plans for development and growth
- ... Enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences
- ... Relate environmental sensitivity, knowledge, problem-solving skills, and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years
- ... Help learners discover the symptoms and real causes of environmental problems
- ... Emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills
- ... Utilize diverse learning environments and a broad array of educational approaches to teaching, learning about and from the environment, with the stress on practical activities and first-hand experience.

*From the Final Report of the Tbilisi
Intergovernmental Conference on Environmental
Education, Tbilisi, Georgia, USSR, 1977.*

mental issues, basic awareness provides the student with the underlying motivation for environmental action, namely a desire to protect that which the student has come to know and love through personal experience.

Knowledge, or cognitive learning, is the area that receives the most attention and is often considered to be sufficient for "environmental education." This area includes knowledge of the functioning of the ecosystem (energy flow, interdependence, cycles, etc.), an understanding of the role of humans in this system, and an understanding of the impact of human activities on the ecosystem.

In addition, knowledge of environmental issues means understanding the various cultural, ecological, political, economic, and moral implications of each issue.

But without the basic awareness and application

skills, knowledge becomes a mere accumulation of facts, and by itself is insufficient for a complete "environmental" education.

Attitudes, values, and behaviors that will guide a student's behavior toward preserving the ecological integrity of the earth—an environmental ethic—is an essential element in a total environmental education program. An environmental ethic, as conservationist and educator Aldo Leopold once suggested, changes our role as conquerors of the land to members and citizens of the land.

A program to develop positive values in students would include helping them understand how an individual's values and behaviors affect the environment, encouraging the growth of positive values, and supporting students in becoming concerned with and active in promoting the social and environmental welfare.

Skills and participation in taking action on environmental issues is important if students are to become caring citizens.

In environmental education, students learn to identify environmental issues, analyze the issues with regard to the various value positions associated with the issues, identify alternative solutions, and apply the appropriate action strategies. After taking action, students again analyze their action according to the various value positions. Critical thinking skills are essential, as are skills in persuasion, consumerism, political action, and legal action.

The preceding objectives are interrelated, but are intended to be incorporated into the curriculum in a sequential manner.

- Students in early elementary grades (K-3) are the most appropriate recipients of awareness and attitude-building activities and experiences
- Grades 3-6 is the time when emphasis should be placed on obtaining knowledge and related attitudes
- The curriculum in grades 6-9 should place emphasis on knowledge, attitudes, and skills development
- Teaching and learning about the environment in grades 9-12, while strengthening all the foregoing, should concentrate on attitudes, skills, and participation in the decision-making and problem-solving process.

This sequential introduction of various major objectives does not mean that the others can be ignored until their time comes. Rather, in Piagetian terms, these seem to be the times in students' lives when each objective can be most effectively addressed while building on what has gone before, thus building an "environmentally literate citizen."

Effective and Economical Infusion into the Curriculum

One of the most frequently heard reasons for not including environmental education in the curriculum is that "the curriculum is already too full." Administrators feel that they cannot add more courses or requirements to what is now a well-filled school program. This certainly is a legitimate argument in many instances.

But this argument need be of only minor consequence when it comes to making environmental education an element in the development of *all students* if first and continuing attention is given to *infusing environmental topics and activities into all parts of the existing curriculum*. This can be done with no harm to present courses and their objectives, and may result in substantial pluses in many instances.

To be sure, courses with a sharp environmental focus for young people with special interests will always be desirable when conditions permit. But taking advantage of the variety of possibilities for making use of environment-related topics, activities, and experiences in every school will increase the likelihood that all high

schoolers will, when they leave school, be well on their way to becoming environmentally literate men and women.

Achieving this promising outcome will require some extra time and thought on the part of the faculty, and maybe a little money from the school district. But these are ordinary expectations in every school system that is serious about improving the quality of its instructional program.

Across the country, teachers are speaking of the environment and its problems as they discuss the growth of deserts with their world history students, assign a debate topic about acid rain in a speech class, and send their students in Spanish 3 out to interview Hispanic immigrants in their community. Every such effort is to be applauded and encouraged in every way possible.

Environmental education is an approach to teaching and learning that will help students develop the knowledge, skills, and values basic to effective environmental problem solving.

But the full value and impact of the infusion process will be realized only with some measure of coordination within a school but, better yet, within a school system. This process brings together a variety of options, the basis for a developmental sequence, and staff members with many requisite competencies.

A school or school district's environmental education committee can relate a developmental sequence in environmental competence to present courses at various grade levels and suggest possibilities for the infusion of environment-related learning activities in both classroom activities and non-classroom student activities.

Here is an abbreviated outline for infusing environmental topics into a school's curriculum (Engleson, 1985).

1. Select the environmental topics to be infused, based on the appropriateness of the subject and the abilities of the students.
2. Identify the subject area that relates to the chosen environmental topic. Often there will be several areas within a chosen unit within which to incorporate environmental topics.
3. Outline the environmental objectives to be taught within the subject area.
4. Determine the specific environmental content to be included in the lesson(s).
5. Develop new instructional procedures if they are needed. These may include taking field trips, interviewing government officials, participating in simulations, or other activities.
6. Identify new process skills to be developed. These

Table 2
Examples of Environmental Topics Suitable for Infusion into Units in Courses in a Number of
Subjects in Middle Level and Secondary Schools*

Environmental Topic To Be Infused	Subject Area (Grade Level) (Course Title)	Unit or Topic into Which Infusion Will Occur
Rain forest destruction	Social Studies (6) (Cultural Perspectives)	Brazil
Mineral deposition	Science (6)	How rocks are formed
Water quality: Aswan Dam	Social Studies (7) (Global Connections)	Way of life in the Eastern Hemisphere
Barn owls: food chains	Science (7) (Life Sciences)	Food chains, webs, and pyramids
Acid rain	Social Studies (7) (Global Connections)	Western Europe today: Germany
Soils and U.S. history	Social Studies (8) (U.S. Studies)	The westward movement
Groundwater contamination	Science (8) (Earth Science)	The water cycle
Energy: fuel supplies	Science (9) (Physical Science)	Efficiency, science, technology, and society
People: environmental relationships	Social Studies (10) (World Studies)	Eastern religions
Pesticides: Agent Orange	Social Studies (11) (U.S. Studies)	The Sixties: Vietnam
PCBs and other organic chemicals	Science (11) (U.S. Studies)	Biochemistry, science, technology, and society
Environmental protection	Social Studies (12) (Political Science)	Independent agencies: EPA
Noise	Science (12) (Physics)	Waves and their properties: sound

*These examples are selected from Engleson's guide

may include any number of skills such as investigating, formulating, hypothesizing, evaluating, implementing, classifying, and predicting.

7. Identify new materials and human resources that will assist in developing the environmental objectives.

8. Identify related activities and suggested new topics for investigation. Follow-up activities or tangential units may become apparent as the unit is carried out.

Table 2 is a sampling of grade-sequenced topics that might be infused into an existing curriculum. The subject areas in the table are all in the science and social studies fields, where possibilities come to mind most readily, but the rest of the curriculum presents a rich series of options also.

But Infusion Is Not Enough

Although infusion of environmental topics into the existing curriculum is necessary for an adequate environmental education, it is not sufficient for it. Infusion falls short of providing students with the breadth and depth of understanding about the natural world needed to become "environmentally literate" citizens.

In addition, students should be offered, whenever possible, the opportunity to participate in programs and classes that take them outside and immerse them in the natural world. Taking field trips to local wetlands (actually walking knee-deep in the bog), planting trees, hiking into the wilderness, exploring tide pools, and walking in urban areas are examples.

Only with such activities that take students out of the classroom and physically connect them with the natural world can they truly become attuned to nature and

learn to love it. As important as infusion is, a direct and personal connection with nature is essential for developing an environmentally literate person.

Exempli Gratia

■ GARDEN CITY SENIOR HIGH SCHOOL, 170
 ■ Rockaway Ave., Garden City, N.Y. 11530.
 ■ Contact: Julian Kane, science teacher.

In 1982, science teacher Julian Kane and his students joined forces to co-author newspaper articles about waste disposal in coastal waters and problems of development in critical ground-water recharge areas. Students reported on their research at village meetings and joined Kane in radio program discussions of surface and ground water issues.

Along with the fine communication skills that were taught, Kane cites political victories. The curtailment of unnecessary sewerage on Long Island and the construction of a test wastewater recycling facility are two of those achievements. According to Kane, participating in such action projects leads students to work as responsible, knowledgeable, and concerned citizens.

Kane's science courses cover practical information related to the students' environment on Long Island as well as general principles. They learn how a salt marsh absorbs bay pollutants and how important barrier dunes are to curtailing coastal storm waves. They also learn how management of marine fishing and coastal dumping can prevent the depletion of commercial fishing stock. They learn about terrain rehabilitation at strip

mining sites, and vegetation protection against erosion and avalanches.

"Thoughtful conservation of resources is a practical and desirable trait that will help assure a good life for our descendants," says Kane.

WEBSTER OPEN SCHOOL, Minneapolis, Minn.
Contact: Bill Holden, science teacher

Webster Open School is a K-8 alternative school serving the inner city of Minneapolis. It weaves environmental education into its entire curriculum, from writing skills to science and art. According to Holden, "An integral part of the school's philosophy is to bring the community into our school and our students out into the community. We think it is important that our students have the opportunity to develop an active regard for the environment."

Clearly, education must assume a major role in preparing citizens capable of participating in the resolution and prevention of such global issues and problems.

Upper-grade teams participate in extended field and camping trips to parks and environmental centers. Youngsters in grades 6, 7, and 8 look forward to Camp Week at St. Croix State Park, where students, teachers, parents, and volunteers work on topics in history, debate, biology, geology, ceramics, ecology, poetry, and much more.

To quote Bill Holden again, "For many of our students, camp week is the only chance they have to leave the concrete, steel, asphalt, and glass environment of the city and experience the flow of life in the natural environment." Students raise their own funds for these activities.

THE NORTHWEST SCHOOL, 1415 Summit Ave., Seattle, Wash. 98122. Contact: Mark Terry, director.

The entire curriculum of this private school in Seattle is based on student participation and interaction in the environment of the school and the surrounding community. Faculty and staff members are professionals drawn from the community for their expertise in the particular areas they teach.

Students take part in a community-wide recycling project that earns money for school programs. They are also actively involved in the maintenance and operation of the school building, from doing custodial work and fixing meals to installing computer sensors to monitor energy use. Students also conduct energy audits for low-income families, which they follow up by weather-stripping doors and windows where indicated.

"We can't effectively teach about air and water pollution, toxic chemicals, community health, and world food supplies if we don't learn to take care of this building and community," says Paul Witt, occupational health teacher and 1981-82 Washington Biology Teacher-of-the-Year.

CENTERVILLE HIGH SCHOOL, 500 E. Franklin St., Centerville, Ohio 45459. Contact: Jim Rowley.

"The complexity and magnitude of many environmental problems lead young people to the conclusion that they are powerless to effect any change in such problems," says Jim Rowley, a faculty member at Centerville High. They ask, "What can I do to increase public awareness about resource conservation? How can I help solve the problems of soil erosion? What can I do about food shortages in Africa and Asia?"

To help young people see that there are positive and worthwhile answers to such questions, Centerville high schoolers have been involved with a variety of real-life projects such as researching the evolution of African famines and following up the investigation by raising \$10,000 to donate to the Red Cross for famine relief.

Volunteer naturalists from the school's Environmental Studies Center act as guides for elementary school students on study trips to local parks, and students have participated in the planning and implementation of various conservation projects in the Centerville-Washington Township area.

Building citizen competence in environmental problem solving is a hallmark of this program.

SEASIDE HIGH SCHOOL, 1901 Holladay Dr., Seaside, Oreg. 97138. Contact: Edward J. Rippet, principal, and Neal Maine, science coordinator.

Using materials generated through a community-based project called "resource access," Seaside High School offers students experiences designed to demonstrate how the social, political, economic, and ecological forces actively come together in the decision-making process.

Recently, local wetlands issues were selected to demonstrate how federal and state laws are designed to protect the public interest. Instructors with social studies and biology backgrounds provided the classroom leadership. A mitigation project by a local port authority district was used for the field experience. Students reviewed permit applications, interviewed the port director, discussed the project with planners, listened to a citizen advocate, and visited the proposed mitigation site.

Final answers were not pursued by the instructors; instead, they went on to focus on how private citizens can gain access to a system designed to serve and pro-

tect the public's interest.

A number of other wetlands field sites have been selected for future programs.

LEE COUNTY SCHOOLS, 2055 Central Ave., Fort Myers, Fla. 33901. Contact: William Hammond, environmental education director.

Lee County's Environmental Education Seminar Program mixes interested students from five public high schools and one private one in a program that gives them opportunities to study and work on the solution of real-life, community-wide environmental problems and issues. Each year, every student is involved with one individual project and one group project.

Projects have included the purchase of a local swamp through a student-initiated voter referendum, the protection of manatees from man-caused hazards, and collaboration with planners to establish new regulations that now protect the southern bald eagle population in Lee County.

Students who participate in this seminar program develop citizenship and leadership skills, problem-solving abilities, and an understanding of the complexity and interrelation of environmental issues.

SANDY UNION HIGH SCHOOL, 17100 Bluff Road, Sandy, Ore. 97055. Contact: Dennis Crow, principal.

In March 1985, the Oregon Department of Education awarded Sandy Union High School a Vocational Grant-in-Aid to develop a model for integrating science and vocational skills in the high school classroom. The goal was to encourage cooperation among science and vocational teachers, who often cover similar concepts and skills in their courses.

Students constructed a multi-use trail system, redesigned an existing pond and watershed, constructed salmonid hatching boxes, and improved stream habitat for local wildlife in a 40-acre woodland preserve that abuts the campus. The woodland preserve has now become the focal point of instruction in subjects such as English and physical education and is a resource for the entire community.

A Sampling of Other Resources

- *A Guide to Curriculum Planning in Environmental Education*. By David C. Engleson. Wisconsin Department of Public Instruction, 1985.
A book developed to provide assistance and support to school districts in the development of a comprehensive K-12 environmental education program, it is designed to help identify content and instructional

approaches appropriate to local school district programs.

- *Curriculum guides from Lee County, Florida*. Schools describe the infusion of environmental topics into the existing curriculum. Written for district-level planners.
- *Investigating and Evaluating Environmental Issues and Action Skills: A Curriculum Development Project Designed To Teach Students How To Investigate and Evaluate Science-Related Social Issues*. By Hungerford, Litherland, et al. Stipes Publishing Co., 1985.
A guide to provide training in both investigative and action skills needed by the environmentally responsible citizen.

One of the most frequently heard reasons for not including environmental education in the curriculum is that "the curriculum is already too full."

- *Citizen's Guide to Global Issues*. Global Tomorrow Coalition, 1325 G St., NW, Suite 1003, Washington, D.C. 20005.
A collection of reports about areas of environmental concern, along with sources of further information and ideas for action.
- *Trends in Environmental Education*. UNESCO, 7 Place de Fontenay, 75700 Paris, France.
A comprehensive overview of environmental education, including methodologies, philosophies, and materials for all grade levels.

To Summarize

We have an opportunity, through the education of our children, to forge changes in our destiny. Through the educational process, we can develop a responsible and enlightened citizenry that will have the power and the motivation to change the direction in which our human society is headed. But it cannot be done in a vacuum. Educators must share ideas, resources, talents, and energy to achieve this goal.

As Adlai Stevenson once pointed out, we are all passengers on Spaceship earth. Our fates are intertwined. Our problems are shared, as are the solutions.

There are many fine examples of concerned and talented teachers beyond those mentioned above who have developed programs or class procedures in their schools that are contributing to that enlightened citizenry. When that dedication and concern is adopted by all those who plan our schools' curricula across the nation,

we will be planting the seeds of a wiser and more prosperous future, one in which our children can bloom and grow in a healthy, sustaining environment.

Final Report of the Intergovernmental Conference on Environmental Education, UNESCO, Paris, France, 1978.

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